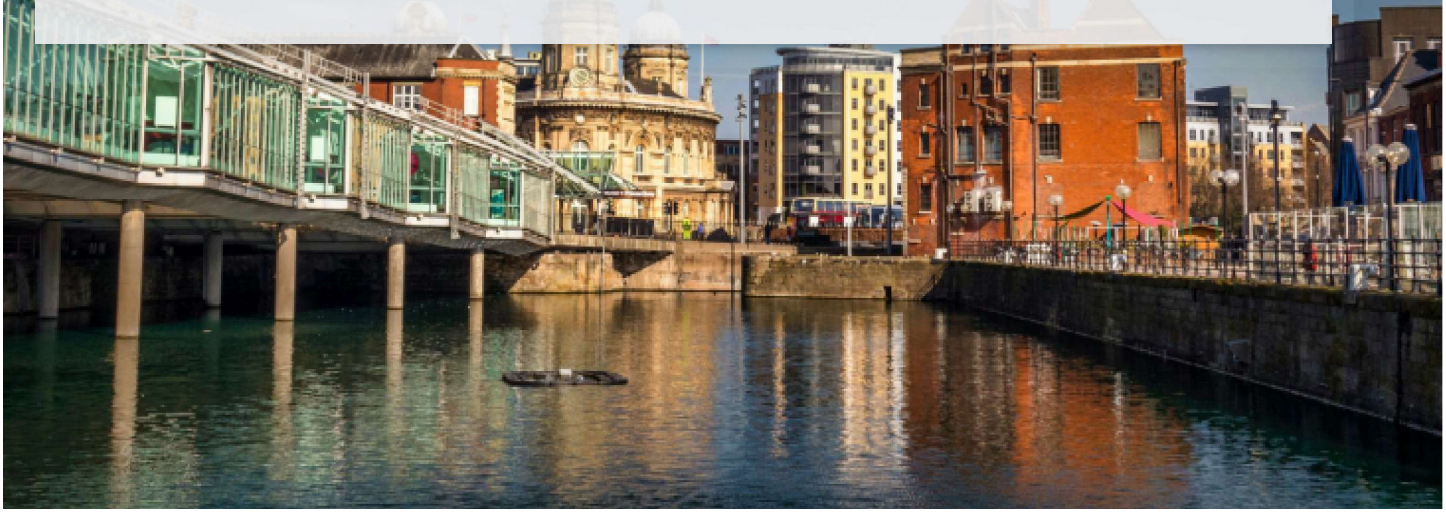
Urban Heat Risk in Hull

Explore this story map to understand who, and where in the city is most vulnerable to extreme heat under current and future climate change.

Met Office

September 8, 2022

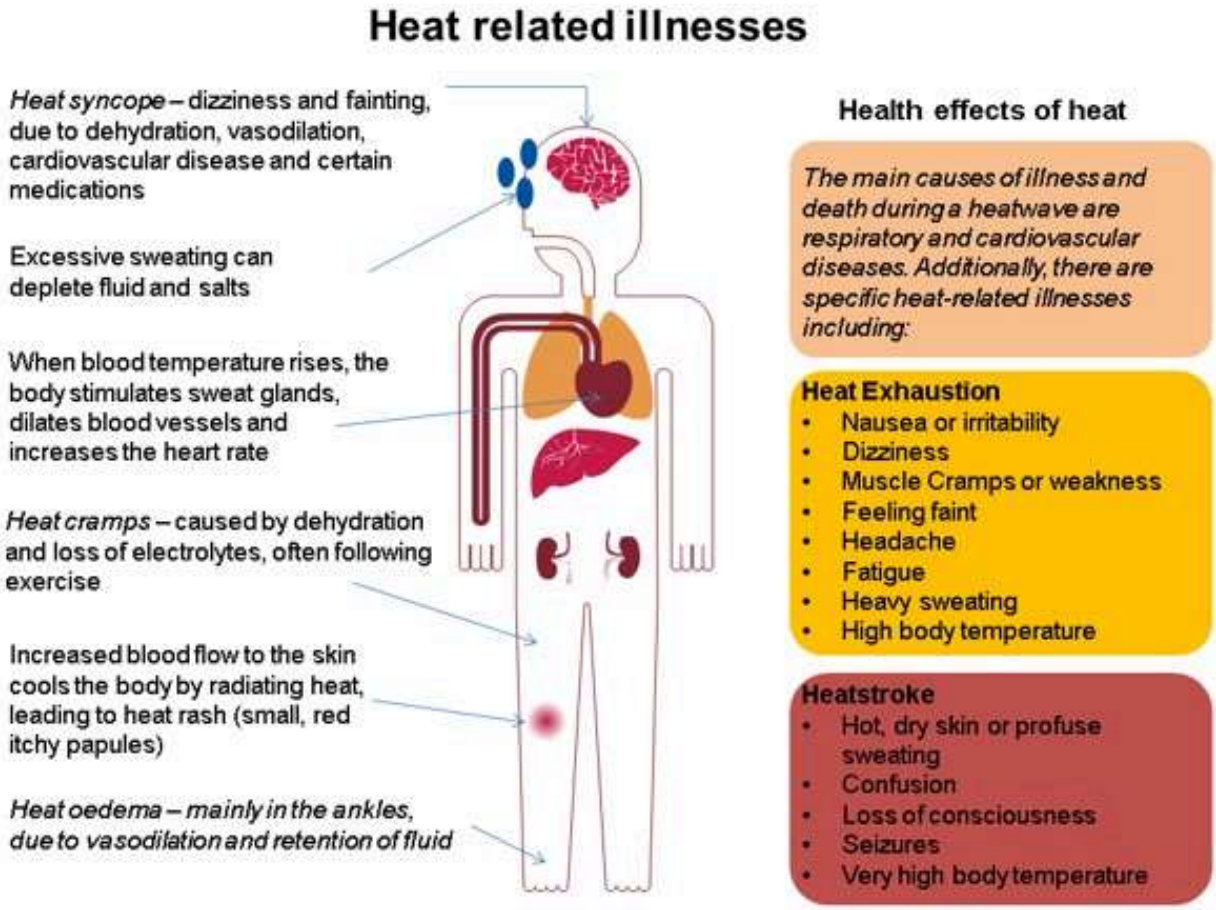


Why is it important to understand heat risk?

The risks to human health, well being and productivity from heat exposure is one of the top climate change risks facing the UK[1].

In the UK, climate change is projected to make our winters milder and wetter and our summers drier and hotter. We can also expect to see an increase in the number of extreme events such as hot days and heatwaves[2].

This storymap explores current and future heat risks to the people of Hull through a Heat Vulnerability Index to understand who the most vulnerable are to extreme heat and where they are located within the city. This is important for emergency and resilience planning for future heat events under a changing climate.



What are the impacts of heat?

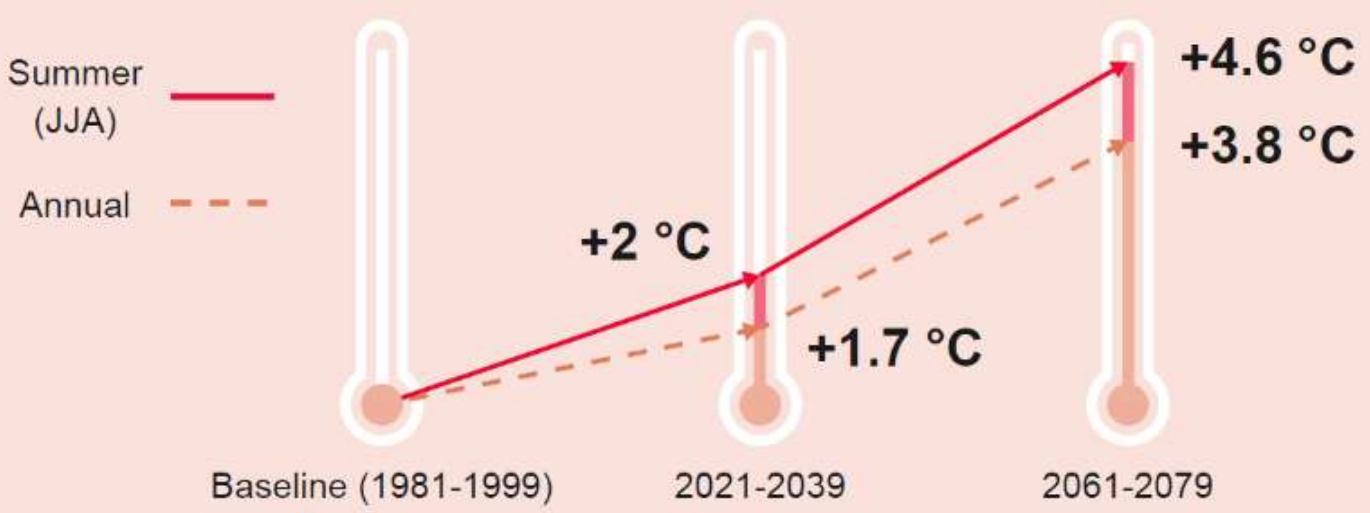
High temperatures can cause an increase in heat-related illnesses such as heat stroke and heat exhaustion.

Temperatures greater than 25°C are associated with excess summer deaths.

The most vulnerable in our society are particularly at risk including older people, those with chronic and severe illness, infants and homeless people[3].

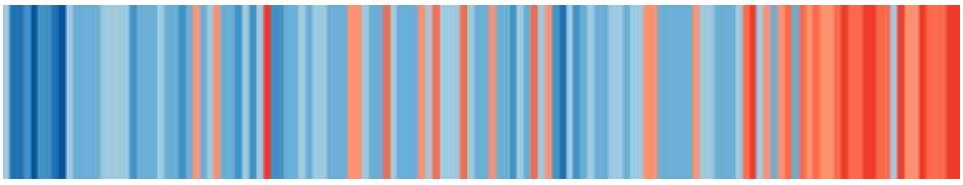
High temperatures can also have negative impacts for our infrastructure, businesses and built environment including:

- Increased water demand.
- Disruption to power supply.
- Delays to railway network as speed restrictions imposed to avoid buckling of tracks.
- Homes and buildings are at greater risk of overheating.
- Reduction in employee productivity[1].



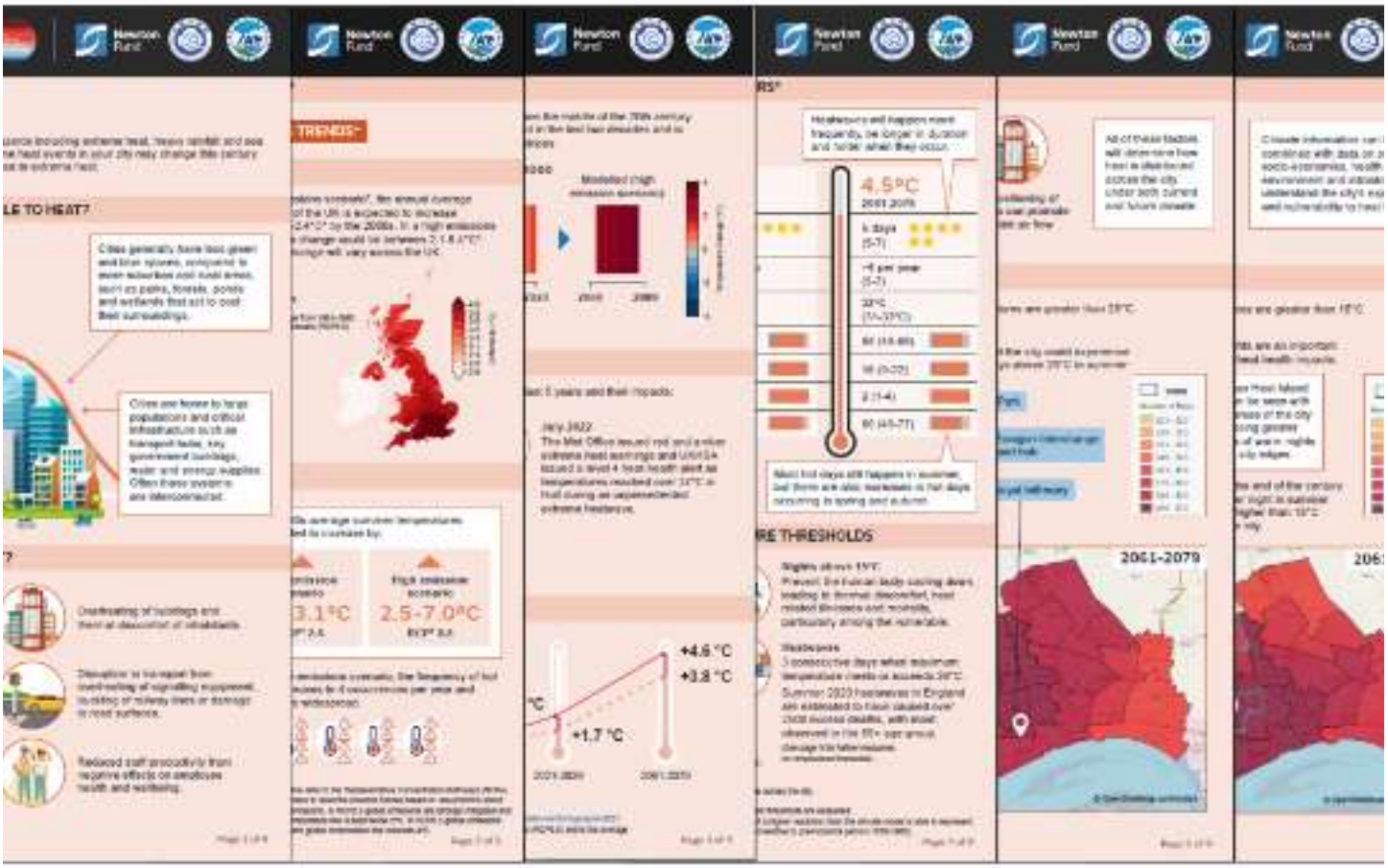
How is temperature changing in Hull?

Average temperatures in Hull have increased since the middle of the 20th century. This trend is in line with the rest of UK and most of this warming has occurred in the last two decades as shown by the warming stripe:



Hull average annual temperature change1884-2020
(concept from Prof. Ed Hawkins #ShowYourStripes)

If global green house gas emissions continue to grow beyond current policy commitments, Hull's average annual temperature could increase by 3.8°C and summer average temperature by 4.6°C towards the end of this century.



While average temperatures are set to increase, we could also see a rise in the number of hot days and warm nights that can have adverse impacts on health, built environment and infrastructure.

The Met Office has developed a Heat Pack for Hull that provides information on how extreme heat events may change in Hull during the 21st century. Click the button to view.

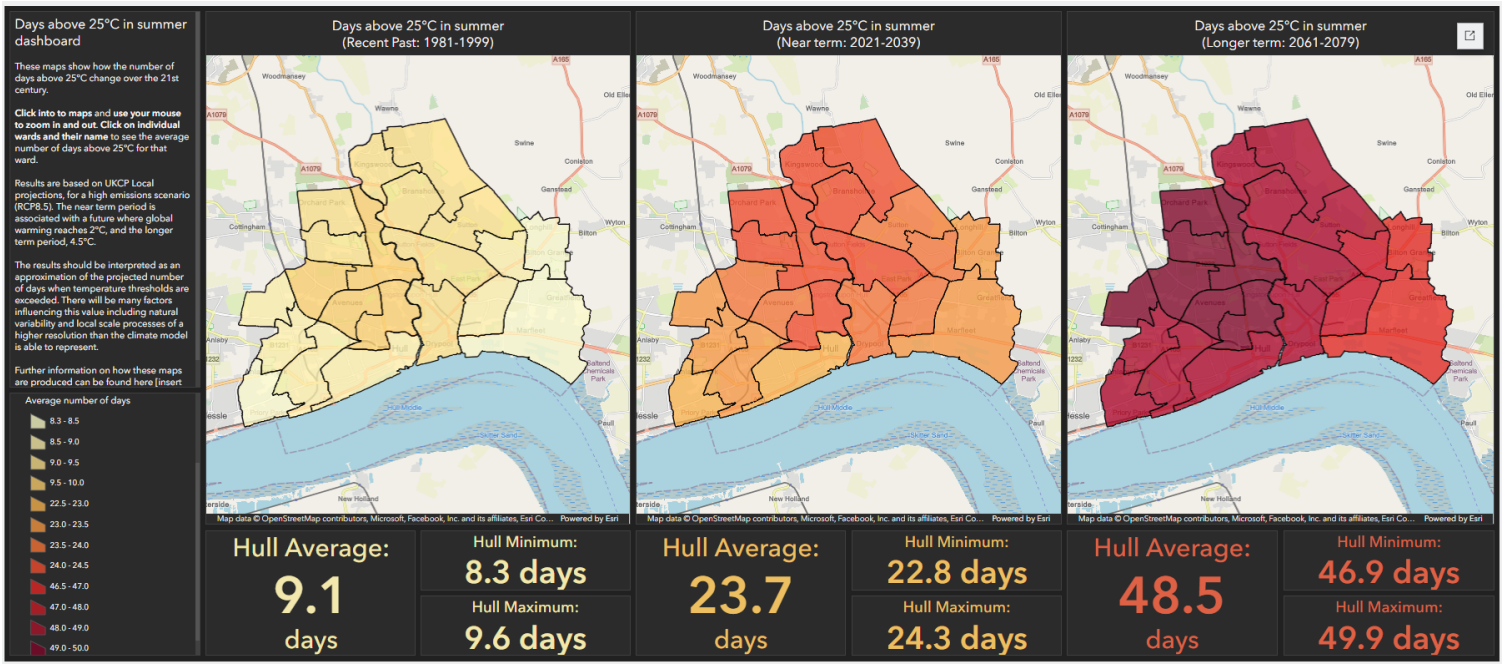
Hull Heat Pack

Scroll down to the dashboards below to explore how the number of hot days and warm nights are changing across the city.

Hot Days in Hull

When daily maximum temperatures rise above 25°C there is an increased risk of heat-related illnesses and mortality. Rail networks begin to implement staged precautions to avoid buckling of tracks. Explore the dashboard below to see how the number of days

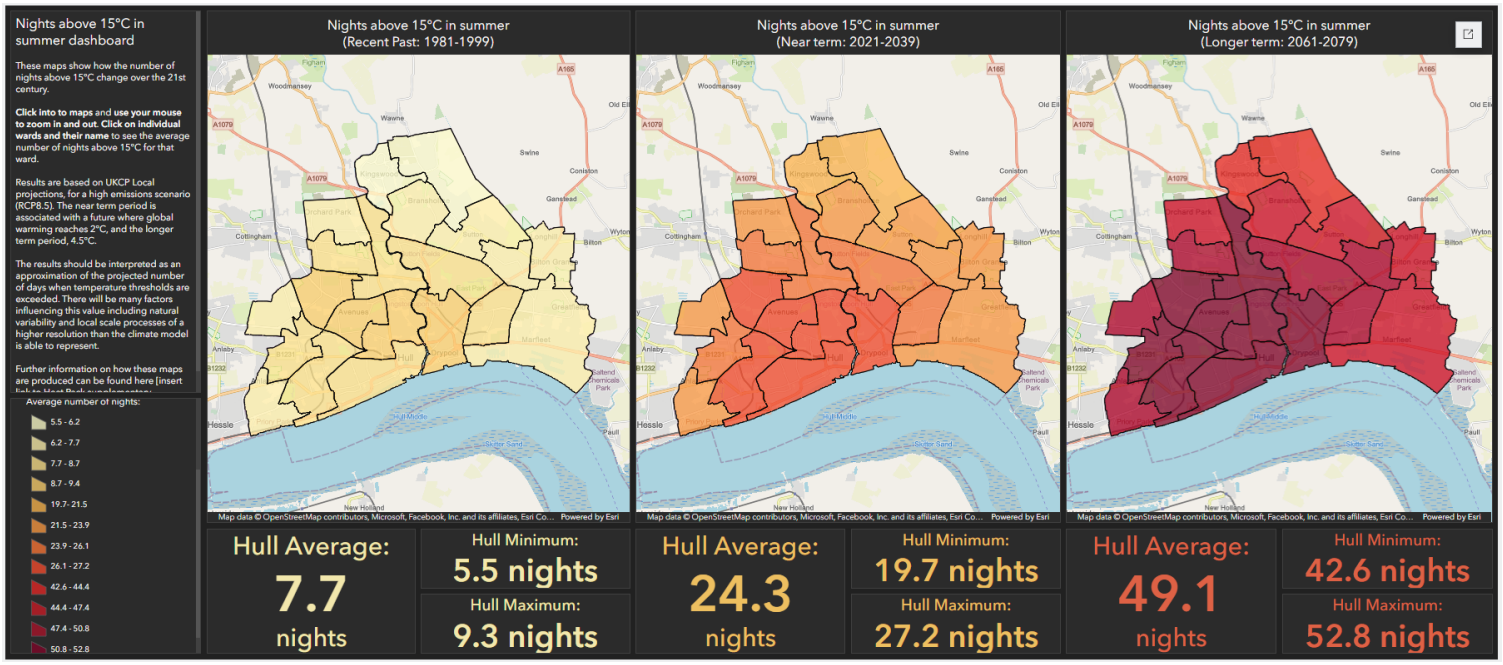
above 25°C is expected to change for Hull over this century. Follow the instructions in the side panel to interact with the maps.



ArcGIS Dashboards

Warm Nights in Hull

When daily minimum temperatures are greater than 15°C the body may find it difficult to cool down from high day time temperatures, leading to thermal discomfort, heat related illnesses and mortality, particularly among the vulnerable. Explore the maps below to see how the number of nights above 15°C is expected to change for Hull over this century.

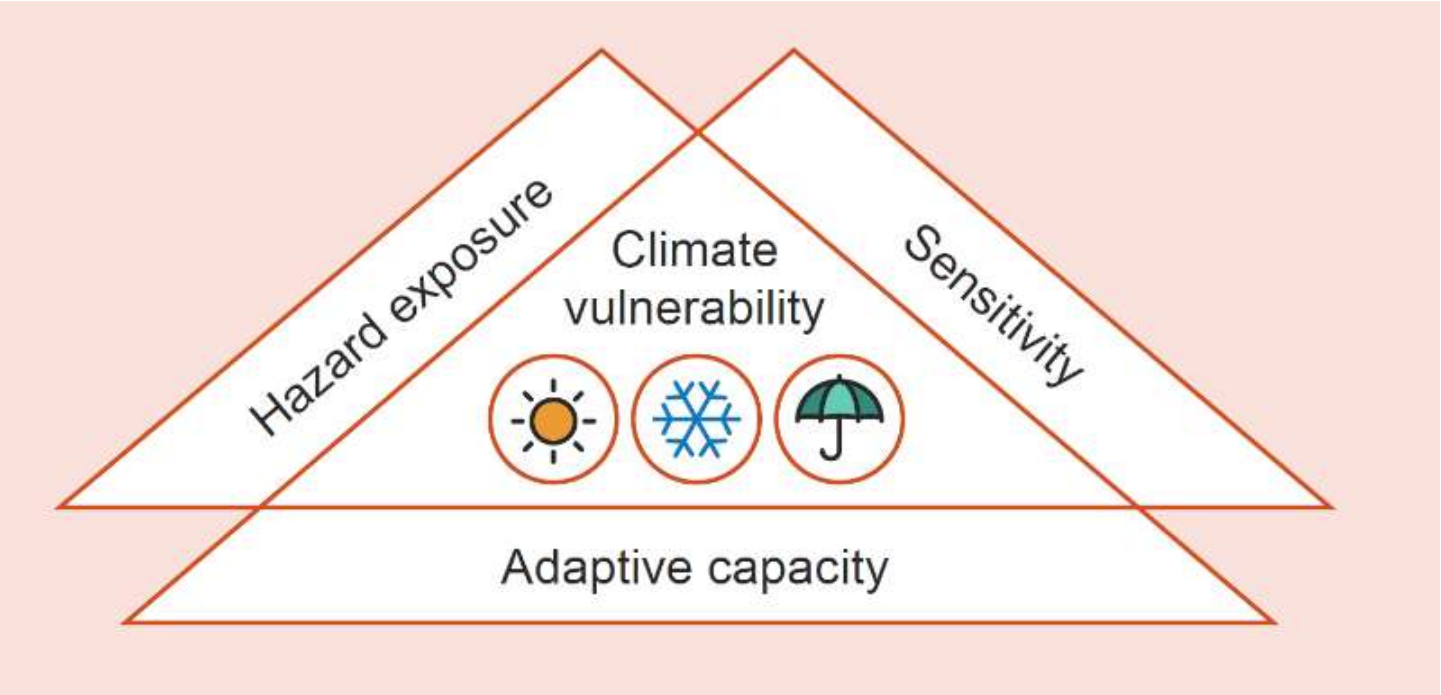


ArcGIS Dashboards

What is a heat vulnerability index?

This storymap explores current and future heat risks to the people of Hull through a Heat Vulnerability Index. **Heat vulnerability** is the degree to which people, assets or a system are susceptible to, and unable to cope with the adverse affects of extreme heat[4].

A **Heat Vulnerability Index** (HVI) is a method to assess the degree to which people or systems are at risk to extreme heat. It provides a relative, numerical score that is used to determine which parts of the city are at greater risk to extreme heat than others. The HVI compares heat vulnerability of the 21 wards in the local authority area of Kingston upon Hull.



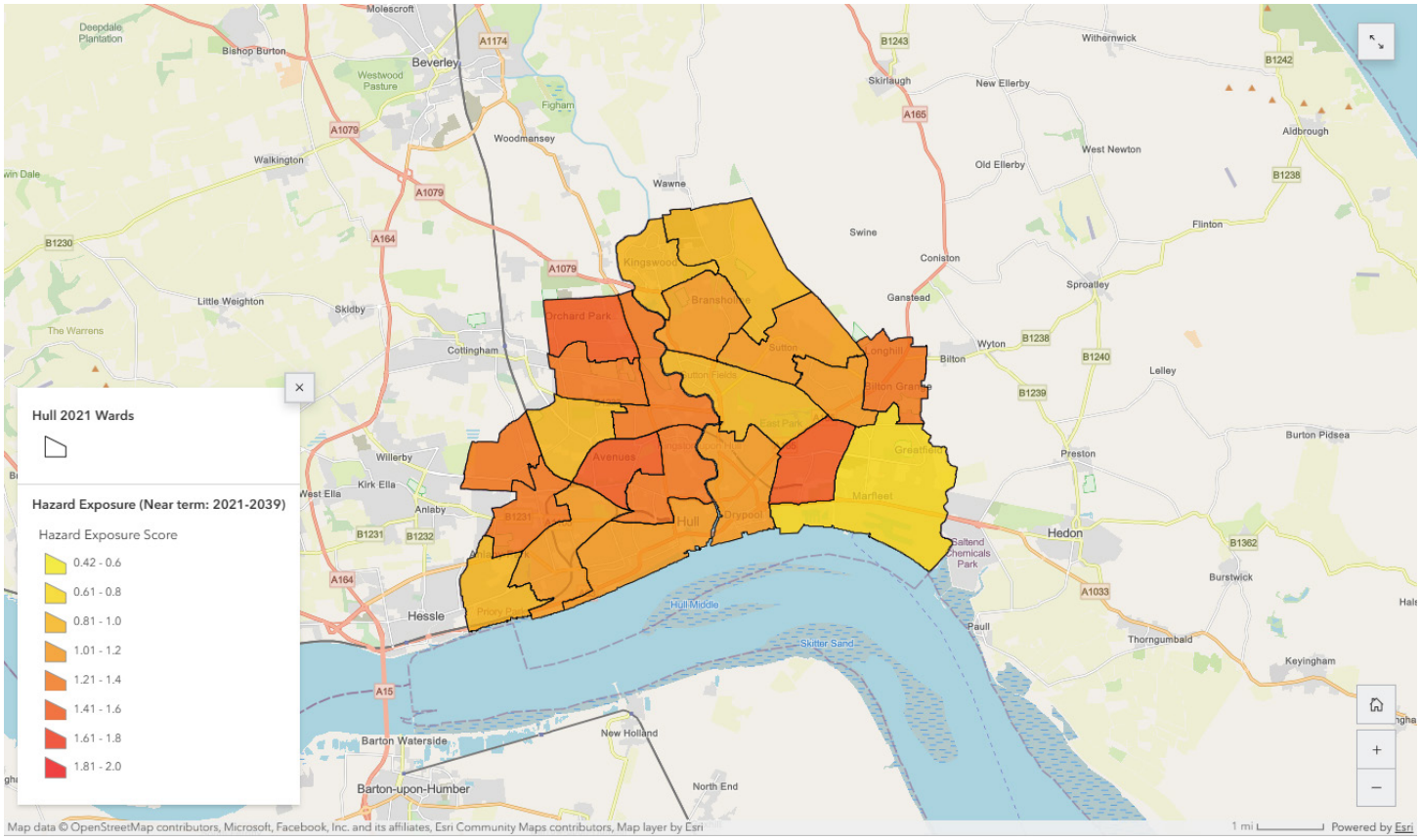
The adverse impacts of heat do not occur equally across populations. How vulnerable people are to heat depends on three aspects:

Hazard exposure - The presence of people in locations that are exposed to high outdoor temperatures or high indoor temperatures due to building characteristics for example.

Sensitivity - The degree to which people are affected, either adversely or beneficially, by high temperatures due to for example, their age or health conditions.

Adaptive Capacity - The ability of people to adjust or respond to potential impacts, or take advantage of opportunities of high temperatures.

Keep scrolling to see which indicators have been used to develop Hull's HVI.



Hazard Exposure

The map on the right compares the hazard exposure of each ward in the **near term**.

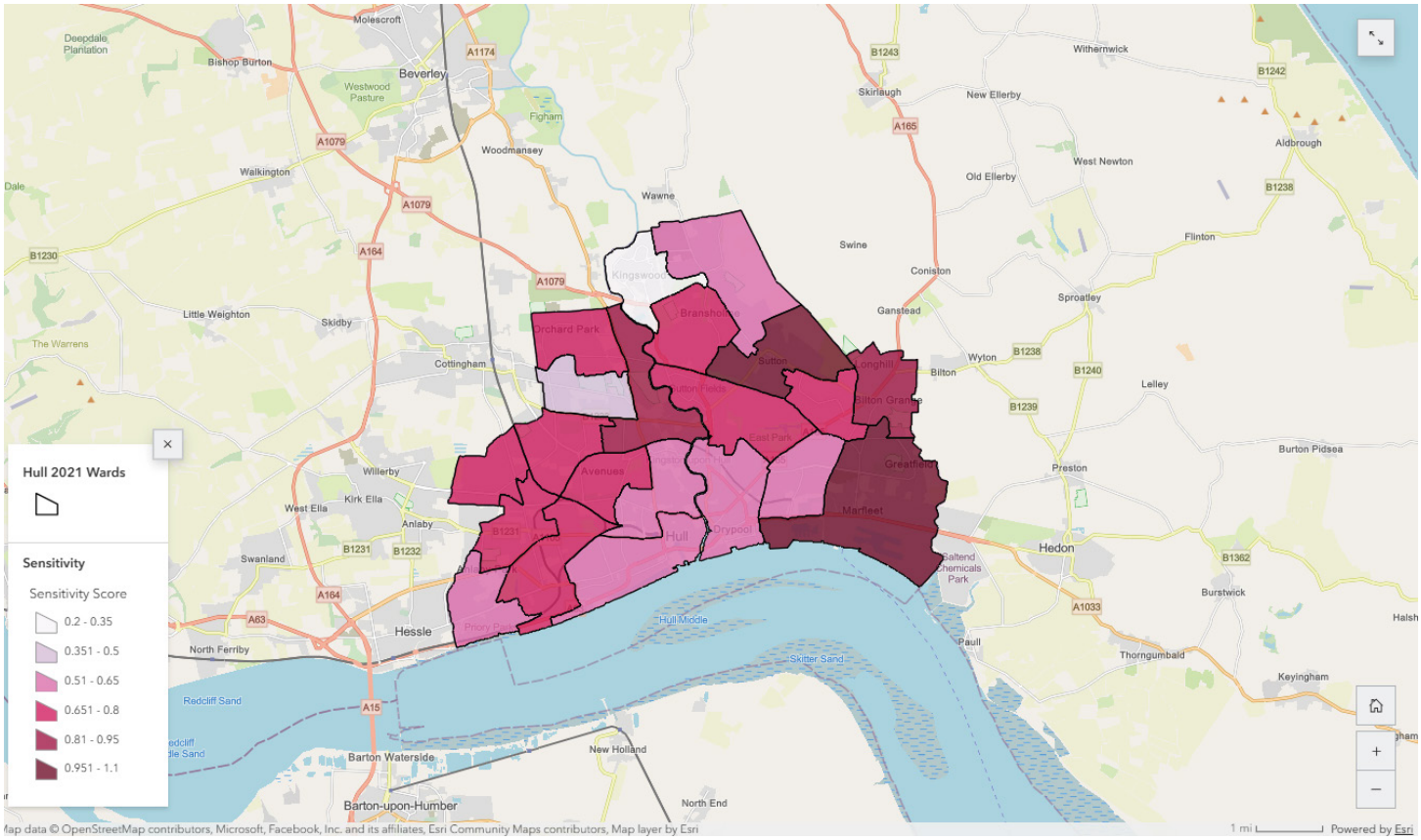
Click on each ward in the map to see the overall hazard exposure score and the underlying scores for each indicator. The higher the score, the greater the overall exposure to the heat hazard.

The indicators used for hazard exposure in Hull's HVI are:

Number of hot days (above 25°C) and warm nights (above 15°C) in summer: High day and night time temperatures prevent the body from cooling down and can cause increased heat-related health conditions and mortality[3]. Temperatures in the recent past, near term and longer term time periods from the dashboards above have been assessed. The higher the temperature indicator index (between 0-1) the greater number of hot days and warm nights projected for a ward.

Population density (the number of people per square kilometre): Densely populated areas expose more people to the heat hazard. The higher the population density index (between 0-1) the higher the population denisty in a ward.

The scores of the two indicators are added together to give the overall hazard exposure score for each ward.



Sensitivity

The map on the right compares the sensitivity of each ward. Click on each ward in the map to see the overall sensitivity score and the underlying scores for each indicator. The higher the score, the higher the sensivity to heat.

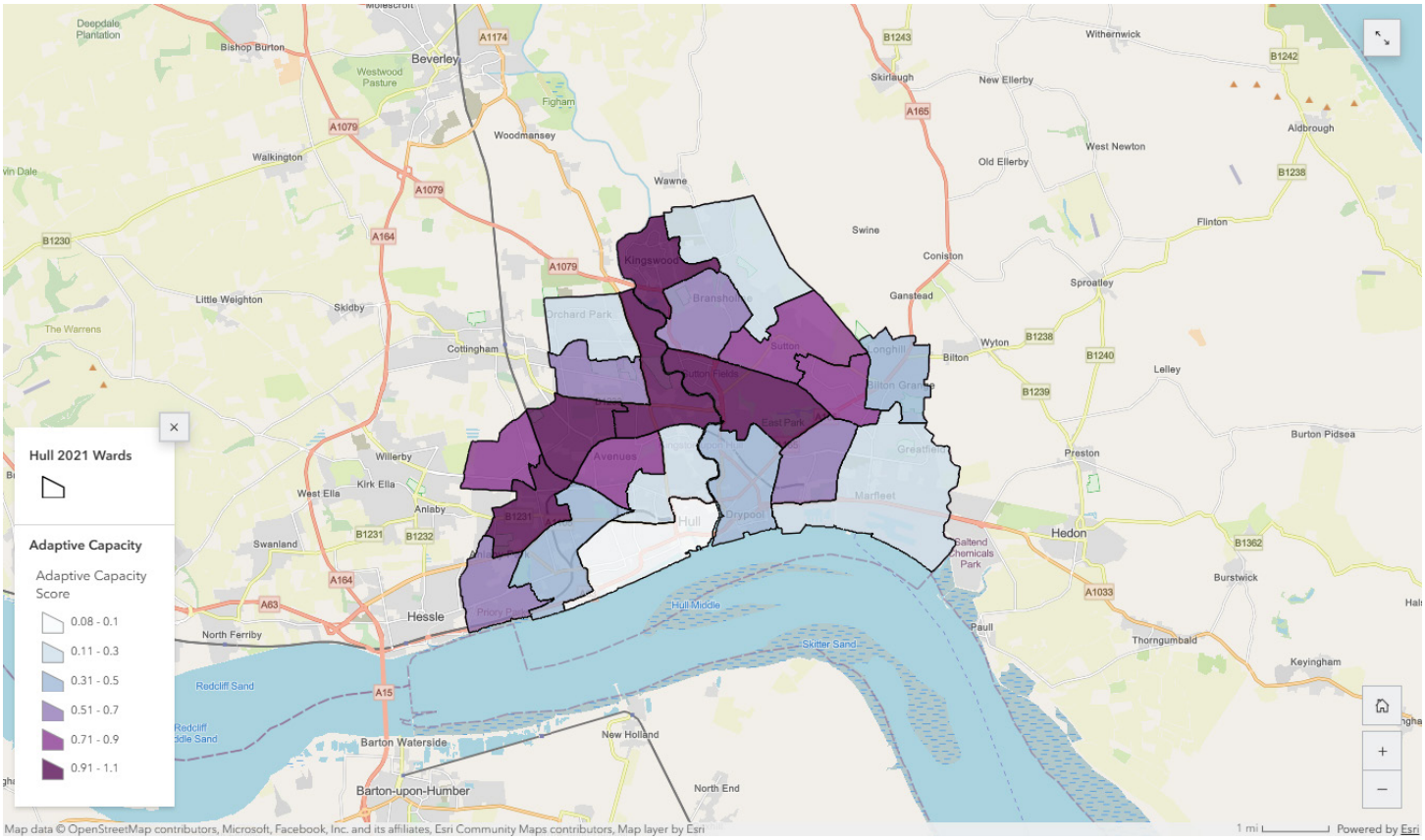
The indicators used for sensitivity in Hull's HVI are:

Proportion of the population aged 65+: Older people are more susceptible of developing heat related illnesses[3].

The proportion of Hull's vulnerable assets within an electoral ward: Schools, hospitals, care homes and residential homes are at greater risk of overheating due to building design. Also residents tend to be more vulnerable and less able to adapt[1].

Proportion of the population with a long term health condition (respiratory or chronic): Those with underling health conditions are more susceptible to developing heat related illnesses[3].

All three indicators above are provided as a value between 0-1 which is equivalent to a percentage e.g. 0.3 = 30% of the ward's population have a long term health condition. They are added together to give the overall sensitivity score for each ward.



Adaptive Capacity

The map on the right compares the adaptive capacity of each ward. Click on each ward in the map to see the overall adaptive capacity score and the underlying scores for each indicator. The lower the overall score, the lower the adaptive capacity.

The indicators used for adaptive capacity in Hull's HVI are:

Level of deprivation: High levels of deprivation may prevent people being able to adapt to high temperatures such as having the means to purchase cooling equipment or travel to cooler spaces. If a ward has a low deprivation index value (between 0-1) then the level of deprivation is high in that ward.

Proportion of publicly accessible green space: Green space acts to cool its surroundings and can offer residents an area of respite to high indoor temperatures. This indicator is given as a value between 0-1, equvalent to the percentage i.e. 0.02 = 2% of ward area is green space.

The scores of the two indicators are added together to give the overall adaptive capacity score for each ward.

Heat Risk in Hull

The components above have been combined using the formula below to assess where the most vulnerable parts of the city are to extreme heat:

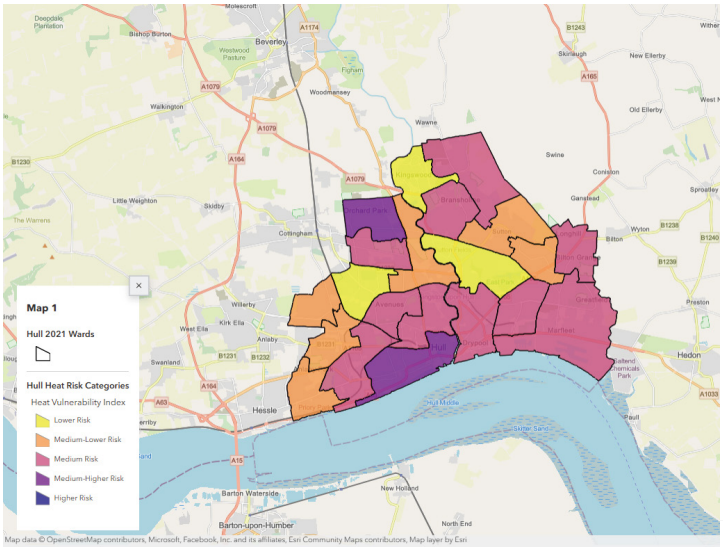
Heat Vulnerability = Hazard Exposure + Sensitivity - Adaptive Capacity

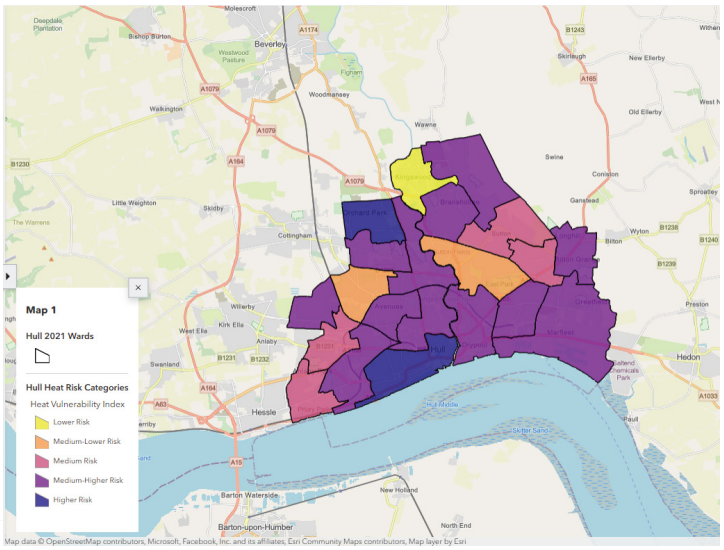
Each ward has been categorised on its level of heat risk based on its HVI score. The HVI provides a reative comparison of risk between wards ranking them in order from highest risk (rank 1) to lowest risk (rank 21).

Use the slider below to discover how heat risk will change over the 21st century as the number of hot days and warm nights increase and all other indicators remain as they are today.

The map on the left of the slider shows heat risk in the near term (2021-2039), and on the right in the long term (2061-2079). Click on the legend button in the bottom left corner to show the risk

categories. Click on the individual wards to see the index scores and ranks.





Most wards move into higher risk categories as temperatures rise. Some wards continue to be more vulnerable than others depending on their exposure to the heat hazard, the sensitivity of residents and the capacity to adapt to high temperatures.

What can we do to manage heat risk?

There are several steps that we can take to manage heat risk as as set out in the UK Climate Change Risk Assessment[1&6]. Click the arrow on the right to explore these steps below.

Green Infrastructure

Creating green spaces and planting urban trees can provide urban cooling along with other benefits for air pollution, flood alleviation and biodiversity.

Heat-proofing buildings

Updating building regulations for new homes and retrofitting existing buildings with shutters, reflective surfaces and natural ventilation can reduce the risk of overheating.

Adaptation responses should be considered alongside net zero carbon goals to prevent maladaptation and realise common benefits in buildings.

Resilient Infrastructure

Mainstreaming climate change adaptation into planning and design of new transport and energy infrastructure and renewal of existing assets to withstand higher temperatures.

Building community resilience

Increasing public awareness of heat risks along with early warning and action keep people safe in hot weather.

The British Red Cross provides simple steps people can take to protect themselves and others in their Feeling the Heat report.

Provide your feedback

The Met Office would like to hear your feedback on this StoryMap to improve this service and understand how it is being used. Please complete this short form using the link to share your thoughts. We value your response: https://forms.office.com/r/hKimqDDy3c

If you would like any further information please contact: urbanclimateservices@metoffice.gov.uk

References & Resources

[1]Committee on Climate Change (2021) Independent Assessment of UK Climate Risk Advice to Government for the UK's third Climate Change Risk Assessment (CCRA3). Available at: https://www.theccc.org.uk/wp-content/uploads/2021/07/Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf

[2]Lowe, J. A. *et al* (2018) UKCP18 Science Overview Report. Met Office. Available at: https://www.metoffice.gov.uk/pub/data/weather/uk/ukcp18/science-reports/UKCP18-Overview-report.pdf

[3]Public Health England (2015) Heatwave Plan for England, Making the case: the impact of heat on health - now and in the future. Available at: https://www.gov.uk/government/publications/heatwave-plan-for-england

[4]IPCC, 2022: *Climate Change 2022: Impacts, Adaptation, and Vulnerability.* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.

[5]Ministry of Housing, Communities & Local Government (MHCLG) (2019) Research into overheating in new homes Phase 1 report. Available at: https://www.gov.uk/government/publications/research-into-overheating-in-new-homes

[6]Committee on Climate Change (2021) UK Climate Risk Assessment - High Temperatures Briefing. Available at: https://www.ukclimaterisk.org/wp-content/uploads/2021/06/CCRA3-Briefing-High-Temperatures.pdf

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